

**We need to look at waste as a great economic  
and environmental opportunity.**

Jim Hightower, Texas commissioner of agriculture  
*Smithsonian*, April 1990

## Forum

### Revisiting Three Mile Island

Nearly 18 years have passed since a radioactive plume escaped from Reactor 2 on Three Mile Island in Harrisburg, Pennsylvania, and dissipated into the atmosphere, but the debate over the potential health effects from the United States' worst commercial nuclear accident continues. In this issue of *EHP*, epidemiologists from the University of North Carolina at Chapel Hill (UNC) reevaluate the data from a 1990 study that concluded that no association between the accident and cancer was apparent in the surrounding population. According to that report, published in the September 1990 issue of the *American Journal of Epidemiology*, "The prior expectation based on estimated releases and conventional radiobiology—that no excess cancer [associated with the accident] would be found—was confirmed in most if not all respects."

But according to Steve Wing, one of the authors of the new study, it was precisely

because these researchers expected to find no excess cancer that none was found. "The basic problem with that study was [its] circular reasoning . . . The people doing the research didn't really believe there was anything to find," he said.

According to Wing, he began to question the results of the 1990 study when someone involved with a class-action suit against the company that runs the TMI utility contacted him. "I was approached by someone who lived in the area of Three Mile Island who had known people with unusual symptoms [and who had seen] problems with pets and the environment" he said. Wing felt there were people in the community who had made noteworthy observations that weren't getting any attention.

This prompted Wing to review the 1990 study, which had been conducted by a group from Columbia University in compliance with a court order issued by Judge Sylvia Rambo of the U.S. District Court for the Middle District of Pennsylvania. According to Wing, the study contained several flaws, which he and his co-authors, David Richardson, Donna Armstrong, and Douglas Crawford-Brown, tried to resolve in their reevaluation. "We only used data collected by the group at Columbia," Wing said. "But we analyzed the cancer groups slightly differently," concentrating on all cancers rather than rare, but especially radiosensitive, varieties like lymphoma. "We also excluded some baseline [cancer] data that the original study included, because for one year, 1975, it was incomplete."

Wing also says that the use of relative, rather than absolute, measures of dose in the reevaluation was an improvement over the original study, which used official exposure estimates (confirmed by a model of the accident and thermoluminescent dosimeter readings) to compare with cancer incidence. "If the premise [in the original study] that maximum doses were no higher than average annual back-

ground levels is not open to question," the UNC researchers write, "then no positive association could be interpreted as evidence in support of the hypothesis that radiation from the accident led to increased cancer rates." Indeed, the original study did find a positive association between exposure and increases in two types of cancer—lung cancer and non-Hodgkin's lymphoma—but the Columbia group concluded that overall, the evidence did not show that these effects were the result of the 1979 accident. This conclusion, says Wing, was the result of author bias.

However, Maureen Hatch, a principal author of the 1990 study, says Wing's allegation that the researchers were biased is unfounded. "We did, in fact, hold open the possibility that there could have been substantial releases during the accident," Hatch said. According to her, the preponderance of evidence, especially the lack of an association between exposure and particularly radiosensitive cancers, pointed to the conclusion that the accident produced no measurable excess cancer in the surrounding population. Hatch counters that the UNC researchers' association with the plaintiffs in a suit against the company that runs Three Mile Island might have biased how they interpreted the data. Hatch's commentary on the reevaluation of the original study, which she conducted with Jan Beyea, Jeri Nieves, and Mervyn Susser, can also be found in this issue of *EHP*.

To Wing, the way in which the effects of the Three Mile Island accident were originally assessed is indicative of problems with the way the United States deals with its nuclear industries. "I think the whole story [of the accident's effects] is just beginning to come out because of a reluctance to release information that was viewed as bad publicity for the nuclear industry and the government," Wing said. "In the case of the Three Mile Island accident, it was very difficult for the researchers to question what the authorities were telling them." In particular, Wing finds fault with Judge Rambo's specifications of how the Columbia researchers should conduct their study and the way dose estimates were obtained under that court order. Wing maintains that, under such conditions, objective research was nearly impossible. He said that he hopes the reevaluation will open up the possibility of more studies on the long-term effects of the accident.



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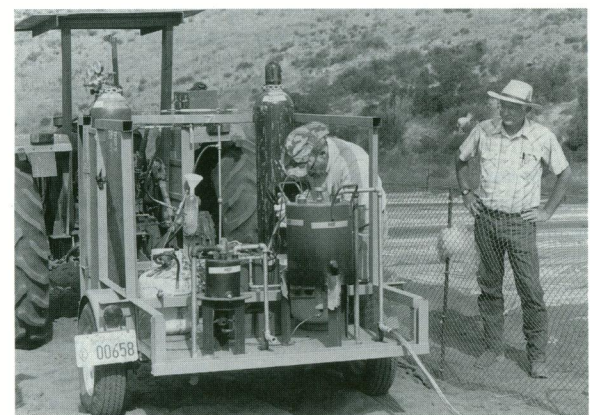
**Rethinking old data.** A researcher takes Geiger counter readings from the Susquehanna River near the Three Mile Island nuclear power plant in 1979.



Though Hatch says that many of Wing's claims of impropriety in the 1990 assessment are "egregious," she agrees that further study is warranted. However, the small population around the plant and the long latency of many of the health effects of radiation make epidemiological studies difficult.

## An Alternative to Methyl Bromide

Methyl bromide, with an estimated "ozone depleting potential" (ODP) of 0.65, falls into the EPA's Class 1 category of ozone depleters which consists of chemicals with an ODP of 0.2 or higher. Therefore, all production, importation, and use of the substance must cease by the year 2001 under the Clean Air Act. Researchers now say that methyl iodide may be an effective replacement for methyl bromide, currently the most widely used universal fumigant in the world.



**Better than bromide.** Plant pathologists Howard Ohr (left) and Jim Sims (right) use hot methyl iodide instead of methyl bromide to fumigate gladiolas.

In the United States, 80% of the methyl bromide used in 1990 was for agricultural purposes. The chemical was used mostly for soil fumigation, including the control of insects, nematodes, weeds, and plant pathogens, as well as for post-harvest, commodity, and quarantine treatments. The phaseout of methyl bromide is expected to have a major impact on U.S. agriculture, especially in California and Florida, where almost half of the nation's methyl bromide is used.

Finding a substitute for methyl bromide has been difficult because the chemical is used for a variety of purposes. Therefore, it is expected that several chemicals or combinations of chemicals will be used as replacements for methyl bromide in most applications.

Researchers at the University of California at Riverside have conducted several studies on methyl iodide for use as a soil fumigant, and have found it to be as effective

as methyl bromide and safer for the ozone layer. "The most important fact about methyl iodide is that it's not an ozone depleter because it will not reach the stratosphere," says Howard Ohr, an extension plant pathologist who is leading the research on methyl iodide at the University of California at Riverside. Ohr says methyl iodide is broken down by ultraviolet light before it can reach the stratosphere. It is estimated that methyl iodide remains in the atmosphere for four to eight days after use, while methyl bromide may remain for two years.

Another important factor is methyl iodide's effectiveness as a pesticide. "Methyl iodide has the same spectrum of kill that methyl bromide does," says Ohr. "In all our tests, methyl iodide is equal to or better than methyl bromide at killing organisms." In addition, Ohr says that at normal use temperature, methyl iodide is a liquid, making it safer for workers to apply than methyl bromide, a gas that can be toxic through inhalation.

However, there are some health concerns about methyl iodide. According to Ohr, methyl iodide has the same carcinogenicity as methyl bromide. Methyl bromide has been found to affect the respiratory system and nervous system, as well as cause genetic damage, such as birth defects. "With any harsh chemical there are drawbacks," Ohr says. "[Methyl iodide] has to be used with care and caution."

Some environmental groups are critical of the use of any chemicals as alternatives, encouraging, rather, the use of environmentally sustainable methods. "In the search for alternatives to methyl bromide, the consistent focus has been on finding a chemical silver bullet solution," says Kert Davies, an analyst for the Environmental Working Group, "but there isn't one." Davies says that not enough funds are being allocated to the search for sustainable methods. "What we need is creative, diligent research on nonchemical biological and cultural controls—long-term solutions," he said.

Ohr agrees that such alternatives would be ideal, but points out that they will not be developed and ready for implementation in the near future. "[Those sustainable alternatives] are not going to feed the world in the meantime," Ohr says. Methyl iodide is an effective soil fumigant that can be used in the interim until other alternatives are discovered, he says. Ohr says that many companies are interested in methyl iodide, and the next step will be for a company to buy the licens-

ing rights from the University of California at Riverside and register the chemical with the EPA. Ohr expects that the licensing will occur in the next six months, and the registration could take up to seven years.

The EPA is currently reviewing the literature and research on methyl iodide, says Bill Thomas, director of the EPA's methyl bromide program. "[Methyl iodide] looks efficacious—it looks like it does a good job of controlling pests," Thomas said, "but the jury is still out on the toxic information and the environmental fate."

## Fran Squeezes the Life Out of NC Waters

After Hurricane Fran ushered in more than 8 inches of rain and wind gusts up to 100 miles per hour at some inland locations, investigators looked below the surface of the disaster to gauge the impact on eastern rivers and estuaries. What they found overwhelmingly were lifeless waters devoid of oxygen.

North Carolina was the state hit hardest by the September 5–6 storm, which toppled beachfront houses and leveled miles of protective dunes. Inland, some rivers rose 15 feet above flood stage at velocities expected to occur only once in 500 years, the U.S. Geological Survey reported.

After Fran, runoff to coastal rivers, tidal creeks, and estuaries created conditions of oxygen-starved water, the distribution and duration of which some researchers say they've never before witnessed. The deluge carried a dangerous mix of components: raw human sewage (diverted from wastewater treatment plants shut down by power outages), animal wastes, and runoff from farm fields and urban areas all requiring a quick fix of oxygen to decompose and break down. As a result, major river stretches experienced prolonged periods of anoxia—up to 3 weeks—which contributed to at least 40 reported fish kills, according to Jim Overton, acting assistant chief of the North Carolina Division of Water Quality's Water Quality Section.

Overton wasn't able to estimate the number of dead fish, but said kills included largemouth bass and sunfish, as well as catfish—bottom-dwellers that are fairly tolerant of poor water quality. Evidence of Fran's casualties was quickly swept away by high-velocity currents.

North Carolina shellfishermen along the central and southeast coast came up virtually empty for September, a prime month for hand-harvest of clams. Due to runoff containing high counts of fecal coliform (harmless bacteria that piggyback with insidious pathogens), some shellfishing areas remained closed up to a month, says George Gilbert,